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Reliable Line-of-Sight and Non-Line-of-Sight Propagation Channel Identification in Ultra-Wideband Wireless Networks

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Abstract : The paper addresses the problem of line-of-sight (LOS) vs. non-line-of-sight (NLOS) propagation link identification in ultra-wideband (UWB) wireless networks, which is necessary for improving the accuracy of radiolocation and positioning applications. A LOS/NLOS likelihood hypothesis testing approach is applied based on exploiting distinctive statistical features of the channel impulse response (CIR) using parameters related to the “skewness” of the CIR and its root mean square (RMS) delay spread. A log-normal fit is presented for the probability densities of the CIR parameters. Simulation results show that different environments (residential, office, outdoor, etc.) have measurable differences in their CIR parameters’ statistics, which is then exploited in determining the nature of the propagation channels. Correct LOS/NLOS channel identification rates exceeding 90% are shown to be achievable for most types of environments. Additional improvement is also obtained by combining both CIR skewness and RMS delay statistics.

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